

Energy Efficiency & Renewable Energy

Kate McMordie Stoughton
 C.E.M., LEED AP
 Pacific Northwest National Laboratory

STRATEGIC WATER MANAGEMENT PLANNING

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Conservation vs. Efficiency?

Conservation: reducing water use in the existing equipment or process

Efficiency: utilizing new equipment that performs the same function with less water

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Potable vs. Non-potable?

Potable: Sufficient quality and permitted for human consumption

Non-Potable: ~~Not~~ sufficient quality nor permitted for human consumption

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Water Management Process

1) Where are you coming from?

2) Where are you now?

3) Where are you going and how will you get there?

4) What to do if....

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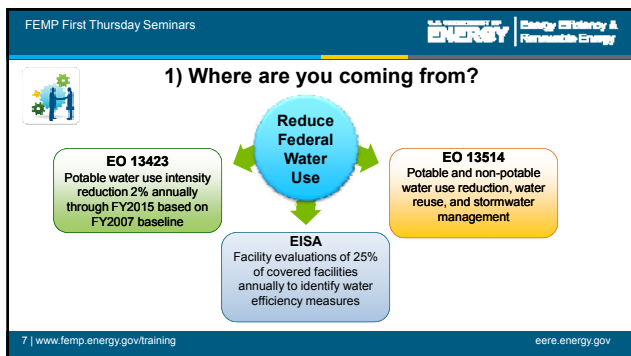
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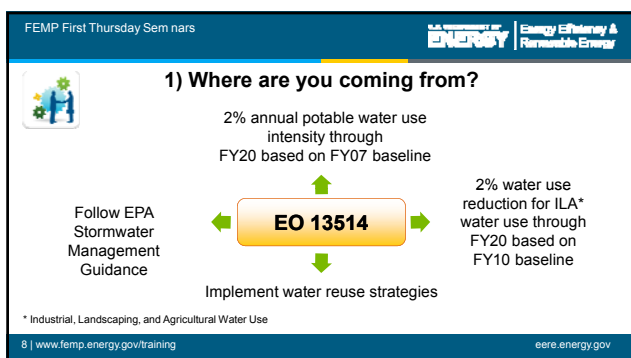
1) Where are you coming from?

Set the stage for your plan...

- Form your team – include many stakeholders: such as operations and maintenance, environmental, and energy
- Identify goals and requirements
- Set your study period
- Choose a unit of measure – be consistent!

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EO 13514 – “ILA” Water Use

ILA Water Use	Definition
Industrial	Aids in processes such as cooling, washing, manufacturing
Landscaping	Applied to outdoor spaces for socio-behavioral, environmental, or aesthetic benefit not satisfied by rainfall
Agricultural	Irrigation and related uses for agriculture including food, animal and livestock, and agricultural research

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EO 13514 Proposed Guidance – “ILA” Water Use

- Reduction for total volumetric use
- Only sources of ILA water use **NOT** currently tracked as part of potable water consumption intensity reduction will be tracked in this new category.
- Helps to avoid changes in FY07 baseline and redundant or overlapping reporting

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Stormwater Guidance

- EPA developed guidance on stormwater management for Federal facilities per EISA 2007





For more information:
<http://www.epa.gov/owow/nps/lid/section438>

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Source for More Information

- Alliance for Water Efficiency resource for state by state info on conservation and regulatory issues:
<http://allianceforwaterefficiency.org/water-efficiency-US.aspx>



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Facility Water Cycle

Water Utility

Consumer

Distribution System Leaks

Recycle/Reuse

End-Use

Sewage Treatment Facility

Discharge

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Perform a Water Balance

Identify where it goes

Water Sources


Water Uses

What goes in must come out...Somewhere!


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Collect Background Information

- Identify all sources of water both potable and non-potable
- Utility Information (if water/wastewater service is purchased)
- Water Generation Information (if produce own water)


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Collect Background Information

- Facility Information
 - Building inventory (sq ft, bldg type)
 - Current water end-use technologies
 - Operating schedules
 - Equipment inventory
 - Meter locations/reports
 - Distribution system – length, type, pipe type and condition


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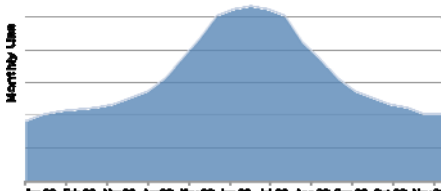


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Measure the Total Supply

Annual Total Supply Curve



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Measure Metered and Unmetered Uses

- **Estimate submetered uses**
 - Buildings
 - Processes
 - Irrigation
- **Estimate unmetered uses**
 - Fire fighting drills
 - Storm main flushing
 - Construction

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Estimate Losses

Loss Type	Cause of Loss	
Leaks ("real")	<ul style="list-style-type: none"> • poor installation • aging materials • incorrect backfill • vibration 	<ul style="list-style-type: none"> • pressure fluctuations • excess pressure • corrosion • loose or damaged parts in valves and meter boxes
Meter Reading Errors ("paper")	<ul style="list-style-type: none"> • aging meters • water quality impacts • extreme heat/cold 	<ul style="list-style-type: none"> • installation errors • incorrect sizing • wrong type for application • non-calibrated meters
Accounting Errors ("paper")	<ul style="list-style-type: none"> • overlapping billing cycles • conversion factor errors • mistakes in billing procedures 	<ul style="list-style-type: none"> • changes in buildings such as renovations where new service lines are in place but not metered

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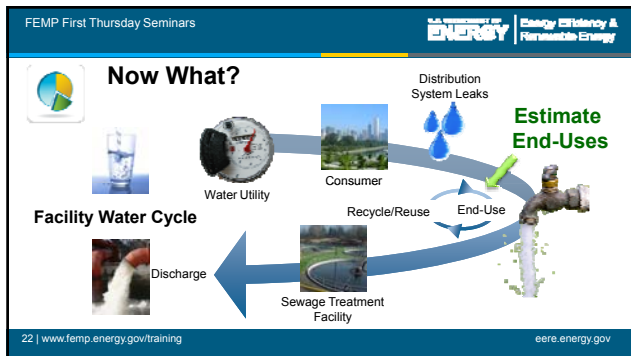
Put It All Together...

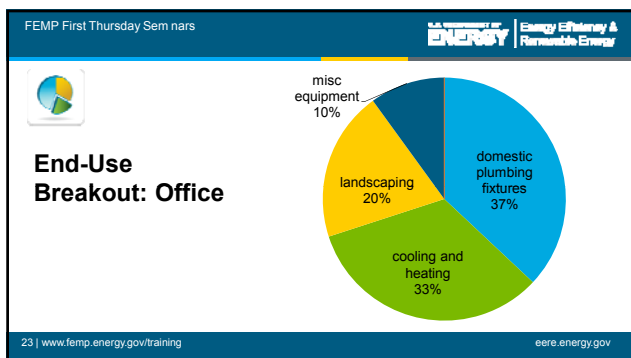
Annual Water Distribution Curve

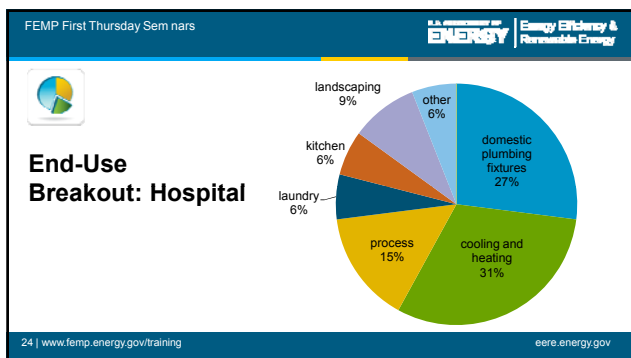
Monthly Use

Jan-09 Feb-09 Mar-09 Apr-09 May-09 Jun-09 Jul-09 Aug-09 Sep-09 Oct-09 Nov-09

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Perform a Walk-Through Survey

- Estimate gender split in each building – occupants have a big impact on water use
- List all water using equipment
- Record hours of operation and operating schedule
- Measure equipment water consumption

GOAL: Estimate water use at end-uses

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Perform a Walk-Through Survey

- Inventory equipment such as:
 - Restroom fixtures
 - Boilers
 - Single-pass cooling
 - Cooling towers
 - Irrigation
 - Vehicle wash station

Things to note during survey: equipment age, condition, flow rate, model number, operating schedule

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Perform a Walk-Through Survey


- Inventory equipment:
 - Laundry
 - Kitchen equipment: fixtures, dishwashing, ice machines
 - Hose bibs
 - Maintenance faucets

Keep an eye out for efficiency opportunities!

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Compile Your Results


What goes in must come out...Somewhere!



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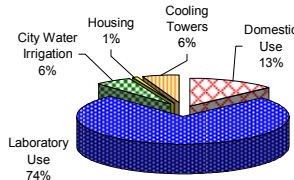
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Compile Your Results


$\sum \text{Total End-Use Water} \leq \text{Total Water Supply}$



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Understand Your Water Bill

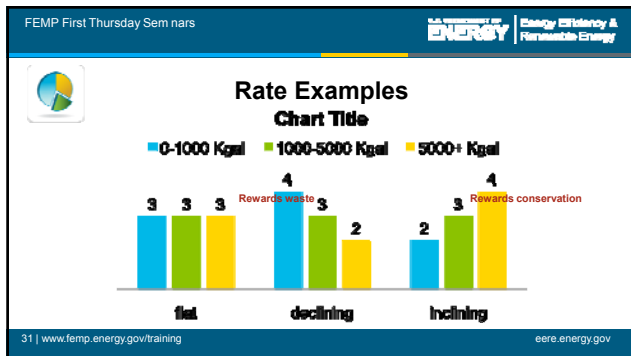
Rate Structures

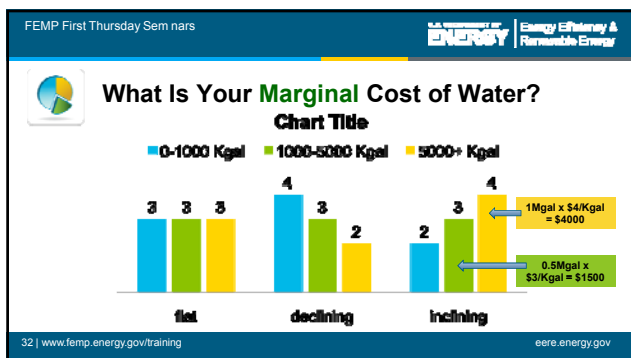
- Flat or uniform rate
- Declining block rate
- Inclining block rate
- Seasonal rate

Other things to note on your bill:

- Meter and service fees
- Billing periods
- Wastewater/sewer charges

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Determine Your Water and Wastewater Costs
Determine other associated costs

- Energy to heat water
- Treatment and chemical costs
- Operations and maintenance costs

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Identify Your Largest Opportunity

Based on the results of your water balance – identify the primary water use and biggest savings potential

Category	Percentage
Laboratory Use	74%
Domestic Use	13%
Cooling Towers	6%
City Water Irrigation	6%
Housing	1%

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FEMP's 14 Best Management Practices Include:

- Water-Efficient Landscaping
- Water-Efficient Irrigation
- Toilets and Urinals
- Faucets and Showerheads
- Boiler/Steam Systems
- Single-Pass Cooling Equipment
- Distribution System Audits, Leak Detection, and Repair
- Cooling Tower Management
- Laboratory/Medical Equipment

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 **Facility Indoor Water Efficiency**

High efficiency toilets (HET)


- Consume no more than 1.28 gallon per flush (gpf)
- Tank toilets – EPA WaterSense labeled
 - Pressure assisted
 - Dual flush
- HET Flush Valve

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 **Facility Indoor Water Efficiency**

Toilet Performance

- Maximum Performance (MaP) Testing:
"real life" test medium for flushing performance


[http://allianceforwaterefficiency.org/Maximum_Performance_\(MaP\)_Testing.aspx](http://allianceforwaterefficiency.org/Maximum_Performance_(MaP)_Testing.aspx)

Note to Remember:
Standard toilets use 1.6 gpf set by EPA '92.
These are NOT considered high efficiency!

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 **Facility Indoor Water Efficiency**

High Efficiency Urinal (HEU)

- Consumes no more than 0.5 gpf
- Flushing urinals: EPA WaterSense labeled
0.5 gpf, 1 quart per flush, 1 pint per flush
- Non-Water Urinal
- Get more information at WaterSense:
<http://www.epa.gov/watersense/products/urinals.html>


Note to Remember:
Standard urinals use 1.0 gpf set by EPA '92. These are NOT considered high efficiency!

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Facility Indoor Water Efficiency



- Faucets:**
 - Public -- UPC/IPC: 0.5 gpm
 - Private -- EPA WaterSense labeled: ≤ 1.5 gpm
- Showerheads:** *(recently released specification)*
 - EPA WaterSense labeled: ≤ 2.0 gpm
- Get more information at WaterSense: <http://www.epa.gov/watersense/products/index.html>


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Facility Indoor Water Efficiency

Commercial Kitchen Efficiency Options



- Energy Star rated dishwashers/ware-washers
- Connectionless food steamers
- Air-cooled ice machines
- Water recycling system for food disposals
- High efficiency pre-rinse spray valves – FEMP purchasing spec ≤ 1.25 gpm




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Facility Outdoor Water Efficiency

Landscaping and Irrigation Resources



- Consider working with a contractor that has been certified through a WaterSense labeled program
- Certified Irrigation Auditor through the Irrigation Association
- Alliance for Water Efficiency



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 **Cooling Tower Water Management**

Innovative Strategies:


- Green chemicals
- Chemical free platforms
- Automation and controls
- Reuse systems



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 **Single-Pass Cooling**

Common equipment to watch for:


- Hydraulic equipment
- Condensers
- Air compressors
- Vacuum pumps
- Ice machines
- X-ray equipment




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 **Lab and Medical Equipment**


- Water purification systems: choose high recovery rate, reuse reject water
- Disinfection/sterilization systems: auto shut down, efficiency retrofit kit
- Photographic and x-ray equipment: go digital!
- Glassware washers: consider recycling systems



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 **Water Reuse**
How can water be "reused"?

- Water recycle: use again in same system
- Industrial reuse: untreated water reused in another process
- Wastewater reclaim: treated effluent reused in another process


Possible sources of "reused" water:

- Wastewater effluent
- Gray water
- Condensate capture
- Reject water from water purification systems


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 **Applications and Strategies for Water Reuse**


- Gray water package units:
http://allianceforwaterefficiency.org/Package_Graywater_Recovery_and_Treatment_Systems.aspx
- Vehicle wash stations
- Laundry
- Cooling tower make-up
- Toilet and urinal flushing
- Irrigation
- Ornamental fountains




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 **Case Study: Sandia National Laboratory Microelectronics Plant**


- Large micro-electronics plant with large ultra-pure water needs
- HERO system in place with 90% recovery rate
- Recycle water in HERO system
- Reclaim reject water for use in cooling tower make-up
- Annual savings is over 140 million gallons



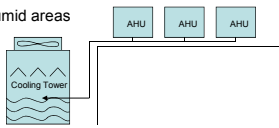
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 **Case Study: EPA Condensate Capture**


- Athens, GA Science and Ecosystem Support Division
- Installed condensate capture of air handling unit to feed nearby cooling tower make-up water
- From May-Dec 08 collected over 540 Kgal
- 16% reduction in water use for site
- Duplicating projects in other humid areas




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 **Leak Detection**


- Zone flow analysis
- Acoustic listening equipment
- Permanent monitoring
- Thermal imaging
- Requires specialized equipment and training




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 **Case Study: Kirtland AFB Leak Detection and Repair**


- Surveyed 108 miles of distribution lines
- Found 31 leaks accounting for 16% of the base' water use
- Saving the base over \$330K per year
- 1.75 year payback
- FEMP award winning project



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Federal Financing Options

- Operations and Maintenance
- Military Construction (MILCON) – DoD only
- Energy Conservation Investment Program (ECIP) – DoD only
- Sustainment, Restoration, and Modernization (SRM) – DoD only
- Pollution Prevention

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Develop Financing Options

Alternative Financing and other options:

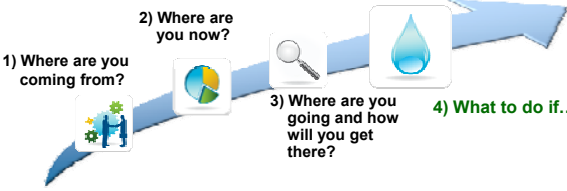
- Energy Savings Performance Contracts (ESPC)
- Utility Energy Service Contracts (UESC)
- Utility rebates and conservation incentives

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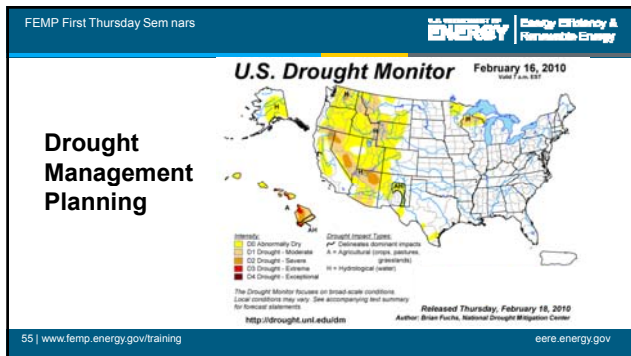
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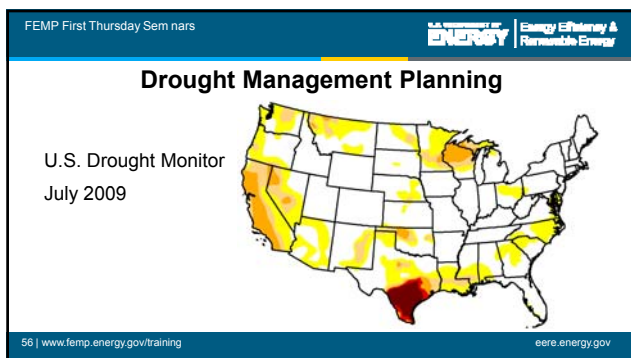
Water Management Process

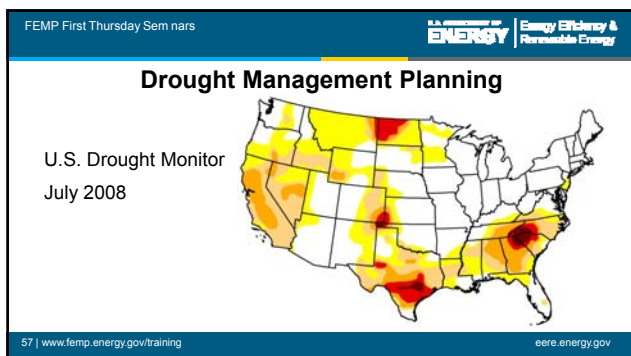


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Where To Find More Information

FEMP: <http://www1.eere.energy.gov/femp/program/waterefficiency.html>

- Federal directives and guidance
- Best Management Practices
- Training: <http://femptraining.labworks.org/>
- Resources
- Case Studies

EPA WaterSense: <http://www.epa.gov/watersense/>

Alliance for Water Efficiency: <http://allianceforwaterefficiency.org>

American Water Works Association: <http://www.awwa.org/>

California Urban Water Conservation Council: <http://cuwcc.org/>

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Federal facilities have a tremendous opportunity to lead by example within their communities to showcase innovative and cost-effective water efficiency strategies.

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Web-based Water Management Training

<http://femptraining.labworks.org/>

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Strategic Water Management Planning

Seminar Evaluation and the Open Book Quiz

Almost done . . .

The link below will take you to the brief open-book Quiz and Evaluation.

Earn a Certificate of Completion for your records!

<http://apps1.eere.energy.gov/femp/training/quiz/water.cfm>

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